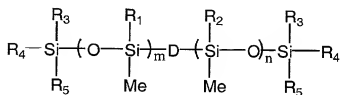


WHAT IS CLAIMED IS:

1. A probe cleaning apparatus for cleaning the end portion of a probe used for testing a semiconductor wafer, comprising:

- (i) an abrasive substrate layer; and
- (ii) a tacky gel layer, wherein said tacky gel layer is in contact with the abrasive surface of the abrasive substrate; said tacky gel layer comprising:

- (a) a silicone base resin having the Formula I:



wherein:

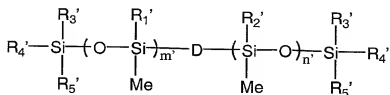
R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub> and R<sub>5</sub> are independently selected from: hydrogen, C<sub>1-6</sub> alkyl, C<sub>1-6</sub> haloalkyl, vinyl or C<sub>1-6</sub> acryloxyalkyl, and at least one of R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub> and R<sub>5</sub> is a vinyl group;

D is a divalent linkage selected from the groups consisting of: -O-, -S-, -(CH<sub>2</sub>)<sub>r</sub>CH<sub>2</sub>-, -(CH<sub>2</sub>)<sub>r</sub>CH<sub>2</sub>O- and -O(CH<sub>2</sub>)<sub>r</sub>CH<sub>2</sub>-, wherein r is an integer from 0-10;

n and m are independently integers from 0 to 1000, and the sum of n and m is not less than about 10; and

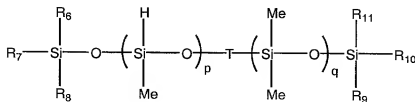
- (b) a cross-linking compound selected from:

- (i) a compound having the Formula II:



wherein,  $R_1$ ,  $R_2$ ,  $R_3$ ,  $R_4$ ,  $R_5$ ,  $m'$  and  $n'$  are independently selected from the groups defining  $R_1$ ,  $R_2$ ,  $R_3$ ,  $R_4$ ,  $R_5$ ,  $m$  and  $n$  above, with the proviso that vinyl is not present; or

(ii) a compound having the Formula III:

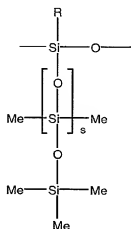


wherein:

$R_6$ ,  $R_7$ ,  $R_8$ ,  $R_9$ ,  $R_{10}$  and  $R_{11}$  are independently selected from: hydrogen,  $C_{1-20}$  alkyl,  $C_{1-20}$  haloalkyl, phenyl or  $C_{1-10}$  alkylphenyl;

$p$  and  $q$  are independently integers from 0 to 800; and

$T$  is selected from the group consisting of: a single bond,  $-(CH_2)_tCH_2-$ ,  $-(CH_2)_tCH_2O-$  or



wherein:

$t$  is an integer from 0-10;  $R$  is selected from:  $C_{1-20}$  alkyl,  $C_{1-20}$  haloalkyl, phenyl or  $C_{1-10}$  alkylphenyl; and  $s$  is an integer from 0 to 800; and

(c) a catalyst;

further wherein:

the chain length of the silicone base resin as defined by the sum of the values for m and n of Formula I, is always greater than the chain length of the cross-linking compound as defined by the sum of the values for m' and n' of Formula II, or the sum the values for p, q and s of Formula III.

2. The probe cleaning apparatus according to claim 1, wherein said abrasive substrate layer is comprised of a material selected from: a transition metal, metal alloy, composite compound, or naturally occurring material.

3. The probe cleaning apparatus according to claim 2, wherein an abrasive surface of said abrasive substrate layer comprises said material in the form of a powder, particle, granule or crystal.

4. The probe cleaning apparatus according to claim 3, wherein said abrasive substrate layer is homogeneous or heterogeneous.

5. The probe cleaning apparatus according to claim 2, wherein said transition metal is selected from the group consisting of copper, nickel, palladium, tungsten, rhenium, rhodium and cobalt.

6. The probe cleaning apparatus according to claim 2, wherein said metal alloy is selected from the group consisting of: palladium/cobalt, molybdenum/chromium and titanium/tungsten.

7. The probe cleaning apparatus according to claim 2, wherein said composite compound is selected from the group consisting of: tungsten carbide, silicone carbide, silicon nitride silicon oxide, aluminum nitride, chrome oxide and titanium nitride.

8. The probe cleaning apparatus according to claim 2, wherein said naturally occurring material is selected from the group consisting of: silica, alumina, diamond, diamond-like carbon.

9. The probe cleaning apparatus according to claim 2, wherein said abrasive substrate layer has surface abrasions obtained from one or more of: surface roughening, plating up, etching, stamping, cutting into the substrate surface, molding or sputtering.

10. The probe cleaning apparatus according to claim 9, further comprising alternating regions of a tacky gel layer and an abrasive surface.

11. The probe cleaning apparatus according to claim 10, wherein said alternating regions of the tacky gel layer rest on the abrasive surface of the abrasive substrate, or said alternating regions of the tacky gel layer are partially embedded in the abrasive substrate.

12. The probe cleaning apparatus according to claim 2, wherein the abrasive substrate layer has an abrasive surface comprising dendritic patterned abrasions.

13. The probe cleaning apparatus according to claim 12, wherein said dendritic patterned abrasions are the same material as the abrasive substrate, and said material is a transition metal.

14. The probe cleaning apparatus according to claim 13, wherein said transition metal is selected from the group consisting of: copper, nickel, palladium, tungsten, rhenium, rhodium and cobalt.

15. The probe cleaning apparatus according to claim 14, wherein said transition metal is copper.

16. The probe cleaning apparatus according to claim 14, wherein the dendritic patterned abrasions further comprise a coating of a harder material, wherein said coating has the same configuration as the dendritic abrasions.

17. The probe cleaning apparatus according to claim 16, wherein said harder material is selected from: tungsten carbide, titanium nitride, or diamond.

18. The probe cleaning apparatus according to claim 1, wherein for the silicone base resin of Formula I, the sum of m and n is from about 10 to 1000.

19. The probe cleaning apparatus according to claim 1, wherein D is oxygen.

20. The probe cleaning apparatus according to claim 1, wherein  $R^3$  is vinyl.

21. The probe cleaning apparatus according to claim 20, wherein either of or both of  $R^4$  and  $R^5$  are methyl.

22. The probe cleaning apparatus according to claim 1, wherein the cross-linking compound has the Formula II.

23. The probe cleaning apparatus according to claim 22, wherein the silicone base resin has the Formula I, and  $R^3$  is vinyl.

24. The probe cleaning apparatus according to claim 22, wherein for the silicone base resin of Formula I, either of, or both of  $R^4$  and  $R^5$  are methyl.

25. The probe cleaning apparatus according to claim 22, wherein the silicone base resin has the Formula I, and D is oxygen.

26. The probe cleaning apparatus according to claim 1, wherein the cross-linking compound has the Formula III, and the sum of p and q is from about 0 to 800.

27. The probe cleaning apparatus according to claim 26, wherein T is a single bond.

28. The probe cleaning apparatus according to claim 26, wherein  $R^6$ ,  $R^7$ ,  $R^8$ ,  $R^9$ ,  $R^{10}$  and  $R^{11}$  are methyl.

29. A probe cleaning apparatus for cleaning the end portion of a probe used for testing a semiconductor wafer, comprising:

- (i) an abrasive substrate layer; and
- (ii) a tacky gel layer, wherein said tacky gel layer is in contact with the abrasive surface of the abrasive substrate; said tacky gel layer comprising:
  - (a) a vinyl siloxane containing silicone base resin having a viscosity of from about 2000 to 10,000 cps; and
  - (b) a hydrosiloxane containing cross-linking compound having a viscosity of from about 2 to 1000 cps, wherein the cross-linking compound does not contain a vinyl group; and
  - (c) a catalyst.

30. The probe cleaning apparatus according to claim 29, wherein said abrasive substrate layer is comprised of a material selected from: a transition metal, metal alloy, composite compound, or naturally occurring material.

31. The probe cleaning apparatus according to claim 30, wherein an abrasive surface of said abrasive substrate layer comprises said material in the form of a powder, particle, granule or crystal.

32. The probe cleaning apparatus according to claim 31, wherein said abrasive substrate is homogeneous or heterogeneous.

33. The probe cleaning apparatus according to claim 29, wherein said transition metal is selected from the group consisting of: copper, nickel, palladium, tungsten, rhenium, rhodium and cobalt.

34. The probe cleaning apparatus according to claim 29, wherein said metal alloy is selected from the group consisting of: palladium/cobalt, molybdenum/chromium and titanium/tungsten.

35. The probe cleaning apparatus according to claim 29, wherein said composite compound is selected from the group consisting of: tungsten carbide, silicone carbide, silicon nitride silicon oxide, aluminum nitride, chrome oxide and titanium nitride.

36. The probe cleaning apparatus according to claim 29, wherein said naturally occurring material is selected from the group consisting of: silica, alumina, diamond and diamond-like carbon.

37. The probe cleaning apparatus according to claim 29, wherein said abrasive substrate layer has surface abrasions obtained from one or more

of: surface roughening, plating up, etching, stamping, cutting into the substrate surface, molding or sputtering.

38. The probe cleaning apparatus according to claim 37, further comprising alternating regions of a tacky gel layer and an abrasive surface.

39. The probe cleaning apparatus according to claim 38, wherein said alternating regions of the tacky gel layer rest on the abrasive surface of the abrasive substrate, or said alternating regions of the tacky gel layer are partially embedded in the abrasive substrate.

40. The probe cleaning apparatus according to claim 29, wherein the abrasive substrate layer has an abrasive surface comprising dendritic patterned abrasions.

41. The probe cleaning apparatus according to claim 40, wherein said dendritic patterned abrasions are the same material as the abrasive substrate, and said material is a transition metal.

42. The probe cleaning apparatus according to claim 41, wherein said transition metal is selected from the group consisting of: copper, nickel, palladium, tungsten, rhenium, rhodium and cobalt.

43. The probe cleaning apparatus according to claim 42, wherein said transition metal is copper.

44. The probe cleaning apparatus according to claim 40, wherein the dendritic patterned abrasions further comprise a coating of a harder material, wherein said coating has the same configuration as the dendritic abrasions.



45. The probe cleaning apparatus according to claim 44, wherein said harder material is selected from: tungsten carbide, titanium nitride, or diamond.

46. The probe cleaning apparatus according to claim 2, wherein said abrasive substrate layer is homogeneous and comprises a single material having an abrasive surface.

47. The probe cleaning apparatus according to claim 46, wherein said abrasive substrate is applied on top of a protective substrate.

48. The probe cleaning apparatus according to claim 2, wherein said abrasive substrate layer is heterogeneous and comprises:

- (a) a first layer of a material, and
- (b) a second layer of a different material than said first layer, having an abrasive surface.

49. The probe cleaning apparatus according to claim 1, wherein said tacky gel layer is self-healing.

50. The probe cleaning apparatus according to claim 29, wherein said tacky gel layer is self-healing.

51. The probe cleaning apparatus according to claim 1, wherein the tacky gel layer comprises from about 2.0 to 5.0 wt.% of a cross-linking compound.

52. The probe cleaning apparatus according to claim 51, wherein said tacky gel layer comprises from about 2.0 to 3.0 wt.% of a cross-linking compound.

53. The probe cleaning apparatus according to claim 1, wherein the catalyst is a curing catalyst.

54. The probe cleaning apparatus according to claim 53, wherein the said curing catalyst is a platinum containing catalyst.

55. The probe cleaning apparatus according to claim 1, further comprising a removable protective film applied to the surface of the tacky gel layer.

56. The probe cleaning apparatus according to claim 29, wherein the tacky gel layer comprises from about 2.0 to 5.0 wt.% of a cross-linking compound.

57. The probe cleaning apparatus according to claim 56, wherein said tacky gel layer comprises from about 2.0 to 3.0 wt.% of a cross-linking compound.

58. The probe cleaning apparatus according to claim 29, wherein the catalyst is a curing catalyst.

59. The probe cleaning apparatus according to claim 58, wherein the said curing catalyst is a platinum containing catalyst.

60. The probe cleaning apparatus according to claim 29, further comprising a removable protective film applied to the surface of the tacky gel layer.

61. A kit comprising a probe cleaning apparatus according to claim 1, and a probe card.

62. A kit comprising a probe cleaning apparatus according to claim 29, and a probe card.

1050908-013802